

Amendment

U.S. Patent Application No. 10/084,614

applying the stream of combined phase adjustments to the digital signals in the serial stream to account for both carrier phase tracking and antenna element beamforming.

35. (New) The method of claim 29, wherein (b) includes applying a single phase adjustment to each of the digital baseband signals, wherein the single phase adjustment jointly accounts for both beamsteering phase rotation and carrier phase rotation.

36. (New) The method of claim 29, wherein (b) includes:
generating a stream of carrier phases for the digital baseband signals;
generating a stream of beam rotation phases for the digital baseband signals;
summing the beam rotation phases and the carrier phases to produce a stream of combined phase adjustments; and
applying the stream of combined phase adjustments to the stream of digital baseband signals to account for both carrier phase rotation and antenna element beamforming.

REMARKS

Claims 1 – 36 are pending in the subject application: claims 1 – 30 have been examined: claims 1 – 4 and 7 – 30 stand rejected, and claims 5 and 6 are indicated as containing allowable subject matter. By the above amendments, claim 1 has been amended, and new claims 31 – 36 have been added. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

As a preliminary matter, the primary reference relied upon by the Examiner, U.S. Patent No. 6,615,024 to Boros et al., is not listed on either of the PTO-892 forms issued by the Examiner. Further, as noted in the previously filed Amendment, U.S. Patent No. 6,549,527 to Tsutsui also has not been listed on a PTO-892 form. Accordingly, Applicant respectfully requests the Examiner to issue another PTO-892 form with the next communication listing both of these documents.

Amendment**U.S. Patent Application No. 10/084,614**

Claims 1 and 22 – 25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,615,024 to Boros et al. Further, claims 2 and 3 stand rejected as being unpatentable over Boros in view of U.S. Patent No. 5,583,562 to Birch et al.; claim 4 stands rejected over Boros, Birch, and U.S. Patent No. 6,768,458 to Green et al.; claims 7 – 10 stand rejected over Boros and U.S. Patent No. 6,831,943 to Dabak et al.; claims 11 – 13 stand rejected over Boros and U.S. Patent No. 6,549,527 to Tsutsui et al.; claims 14 – 16 and 18 stand rejected over Boros and U.S. Patent No. 5,809,422 to Raleigh et al.; claim 17 stands rejected over Boros and U.S. Patent No. 5,937,348 to Cina et al.; claims 19 – 21 stand rejected over Boros and U.S. Patent Application Publication No. 2002/0141478 to Ozluturk et al; and claims 26 – 30 stand rejected over U.S. Patent No. 6,101,399 to Rayleigh in view of U.S. Patent No. 5,631,898 to Dent and U.S. Patent No. 6,072,994 to Phillips et al. Applicant respectfully traverses these rejections for the following reasons.

Independent claim 1 sets forth an apparatus for modulating and demodulating signals transmitted and received via an electronically steerable phased array antenna comprising a plurality of antenna elements. The claimed apparatus includes:

- a baseband modulator configured to modulate outbound digital baseband signals to be transmitted via the phased array antenna;

- a baseband demodulator configured to demodulate incoming digital baseband signals generated from signals received via the phased array antenna; and

- a shared baseband processor configured to receive digital baseband signals including the modulated outbound digital baseband signals and the incoming digital baseband signals, wherein the shared baseband processor applies phases to the digital baseband signals to account for both beamforming phase rotation and carrier phase rotation of individual antenna elements.

Notably, the apparatus of claim 1 requires the shared baseband processor to apply phases to the digital baseband signals to account for both beamsteering and the carrier phase of individual antenna elements (i.e., the baseband carrier phase is applied to the digital signal). As explained on page 9, lines 1-13, digital baseband processors do not generally process carrier phase on an antenna-element-by-antenna-element basis, since the carrier phase is the same for all

Amendment**U.S. Patent Application No. 10/084,614**

antenna elements. In the claimed architecture, the phases applied to the digital baseband signal account for beamforming phase rotation and carrier phase rotation of individual antenna elements. This approach makes it possible to apply a single phase adjustment to each digital baseband signal that jointly accounts for both beamsteering and carrier phase.

Boros does not disclose or suggest applying phases to the digital baseband signals to account for both beamsteering and the carrier phase of individual antenna elements. In particular, the transmit weights referred to by Boros at column 13 (and cited by the Examiner) relate exclusive to beamforming. Boros is completely silent as to how carrier phase modulation is accomplished. In particular, Boros does not appear to include even a general teaching of applying carrier phase rotations to digital baseband signals, much less the more specific claim requirement that the phases applied to the digital baseband signals account for both beamsteering and carrier phase of individual antenna elements. In short, while Boros appears to teach applying beamsteering weights for individual antenna elements, Boros does not disclose or suggest applying carrier phase rotation to digital baseband signals that correspond to individual antenna elements as claimed. Accordingly, the subject matter of claim 1 would not have been obvious from Boros.

The remaining documents cited in combination with Boros are relied upon by the Examiner for teachings of subject matter recited in various dependent claims. Aside from whether these documents teach what the Examiner alleges or whether it would have been obvious to combine these documents in the manner proposed, none of these documents discloses or suggests apply phases to the digital baseband signals to account for both beamsteering and the carrier phase of individual antenna elements, as recited in claim 1. Consequently, the subject matter of claim 1 and its dependent claims would not have been obvious from any combination of the cited documents. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejections of claim 1 and its dependent claims.

Turning to the rejection of claims 26-30 over Rayleigh, Dent, and Phillips, each of independent method claims 26 and 29 includes essentially the same requirement of claim 1 discussed above. In particular, these claims require applying phases to the digital baseband

Amendment**U.S. Patent Application No. 10/084,614**

signals in a serial stream to account for both carrier phase tracking and antenna element beamforming, where the digital baseband signals in the serial stream are associated with individual antenna elements. In other words, both the carrier phase rotation and beamforming phase are applied to signals associated with individual antenna elements. This claim requirement is simply not disclosed or suggested anywhere in Rayleigh, Dent, and Phillips, and the Examiner's arguments do not address this point. Accordingly, the subject matter of claims 26-30 would not have been obvious from any combination of these documents, and the Examiner is respectfully requested to reconsider and withdraw this rejection.

Applicant has added new dependent claims 31 (31/1), 33 (32/26), and 35 (35/29), which require applying a single phase adjustment to each of the digital baseband signals, wherein the single phase adjustment jointly accounts for both beamsteering phase rotation and carrier phase rotation. Further, new dependent claims 32 (32/1), 34 (34/26), and 36 (36/29) require generating a stream of combined phase adjustments by summing a stream of carrier phases for the digital baseband signals with a stream of beam rotation phases for the digital baseband signals, and adjusting phases of the digital baseband signals in accordance with the combined phase adjustments. Note that the limitations in these new dependent claims are somewhat similar to certain limitations found in allowable claim 5 in that the beamsteering and carrier phase are combined and jointly applied to the digital baseband signals.

The Examiner indicates that claims 5 and 6 would be allowable if rewritten in independent form to include all of the limitations of their parent claims and any intervening claims. The Examiner is requested to hold in abeyance the requirement of rewriting of claims 5 and 6 in independent form, until the Examiner has had an opportunity to reconsider (and withdraw) the rejection of parent claim 1 under 35 U.S.C. §103(a).

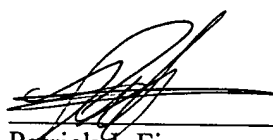
In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1 – 36. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Amendment

U.S. Patent Application No. 10/084,614

Filed concurrently herewith is a Petition (with payment) for an Extension of Time of One Month. Also filed concurrently herewith is payment of an excess claim fee in the amount of \$300 for six (6) new claims in excess of the thirty (30) previously paid for. Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,



Patrick J. Finnan
Registration No. 39,189

EDELL, SHAPIRO & FINNAN, LLC
1901 Research Boulevard, Suite 400
Rockville, Maryland 20850-3164
(301) 424-3640

Hand Delivered on: May 1, 2006